PREDICTING BUS ARRIVAL TIME BYUSING GSM, RFID, GPS TECHNOLOGY

R. SHIVACHARAN [1,] V. SRINIVASULU [2]

[1] Dept of ECE, M.Tech Student, Brilliant Institute Of Engineering & Technology, Abullapur Met, Hayathnagar Mandal, Rangareddy Dist., Telangana, India.

[2] V.Srinivasulu, M.Tech., Assistant Professor, Brilliant Institute Of Engineering & Technology, Abullapur Met, Hayathnagar Mandal, Rangareddy Dist., Telangana, India.

Abstract—The bus arrival time is primary information to most city transport travelers. Excessively long waiting time at bus stops often discourages the travelers and makes them reluctant to take buses. In this paper, we present a bus arrival time prediction system based on bus passengers' participatory sensing. With commodity mobile phones, the bus passengers' surrounding environmental context is effectively collected and utilized to estimate the bus traveling routes and predict bus arrival time at various bus stops. The proposed system solely relies on the collaborative effort of the participating users and is independent from the bus operating companies, so it can be easily adopted to support universal bus service systems without requesting support from particular bus operating companies. Instead of referring to GPS-enabled location information, we resort to more generally available and energy efficient sensing resources, including cell tower signals, movement statuses, audio recordings, etc., which bring less burden to the participatory party and encourage their participation.

Index Terms—Bus arrival time prediction, participatory sensing, mobile phones, cellular-based tracking

INTRODUCTION

Public transport, especially the bus transport, has been well developed in many parts of the world. The bus transport services reduce the private car usage and fuel consumption, and alleviate traffic congestion. When traveling with buses, the travelers usually want to know the accurate arrival time of the bus. Excessively long waiting time at bus stops may drive away the anxious travelers and make them reluctant to take buses. Nowadays, most bus operating companies have been providing their timetables on the web freely available for the travelers. The bus timetables, however, only provide very limited information (e.g., operating hours, time intervals, etc.), which are typically not timely updated. Other than those official timetables, many public services (e.g., Google Maps) are provided for travelers. Although such services offer useful information, they are far from satisfactory to the bus travelers. For example, the schedule of a bus may be delayed due to many unpredictable factors (e.g., traffic conditions, harsh weather situation, etc). The accurate arrival time of next bus will allow travelers to take alternative transport choices instead, and thus mitigate their anxiety improve their experience. Towards this aim, many commercial bus information providers offer the real time bus arrival time to the public. Providing such services, however, usually requires the cooperation of the bus operating companies (e.g., installing special location tracking devices on the buses), and incurs substantial cost. In this paper, we present a novel bus arrival time prediction system based on crowd-participatory sensing. We interviewed bus passengers on acquiring the bus arrival time. Most passengers indicate that they want to instantly track the arrival time of the next buses and they are willing to contribute their location information on buses to help to establish a system to estimate the arrival time at various bus stops for the community. This motivates us to design a crowd-participated service to bridge those who want to know bus arrival time (querying users) to those who are on the bus and able to share the instant bus route information (sharing users). To achieve such a goal, we let the bus passengers themselves

cooperatively sense the bus route information using commodity mobile phones. In particular, the sharing passengers may anonymously upload their sensing data collected on buses to a processing server, which intelligently processes the data and distributes useful information to those querying users. Our bus arrival time prediction system comprises three major components:

(1) Sharing users: using commodity mobile phones as well as various build-in sensors to sense and report the lightweight cellular signals and the surrounding environment to a backend server;

(2) Querying users: querying the bus arrival time for a particular bus route with mobile phones;

(3) Backend server: collecting the instantly reported information from the sharing users, and intellectually processing such information so as to monitor the bus routes and predict the bus arrival time.

No GPS or explicit location services are invoked to acquire physical location inputs.

THE HARDWARE SYSTEM

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (**LCD**) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary

images are made up of a large number of small pixels, while other displays have larger elements.
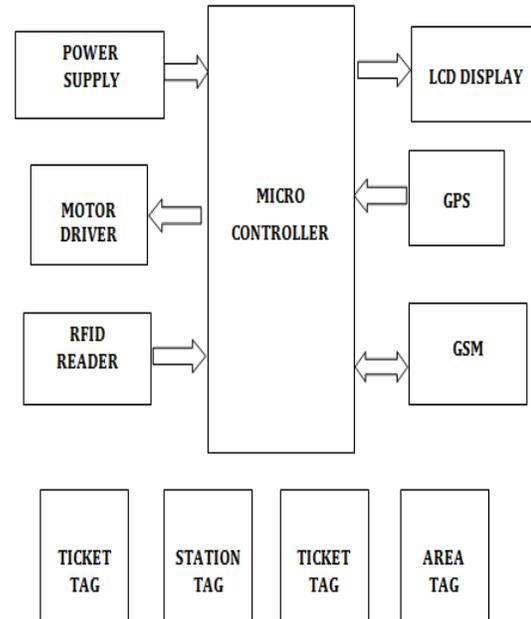
DESIGN OF PROPOSED HARDWARE SYSTEM

Fig: Block Diagram

Bus is provided with a rfid reader to read multiple tags information here we are using rfid application for four applications

1. To provide ticketing system for passengers
2. To update the area information
3. To update the bus stop information

On roads with proper vicinity the tags have been placed and when ever bus enters into the particular Area from the tag the location will be updated and the stop arrival is also updated automatically through rfid then the bus is stopped and door will be opened, here. There is also scope for replacement of conductor i.e. passengers are provided with rfid tags and the tags shown by passengers valid means then only the door will be opened. The major advantage in the system is the location of bus is shown on map through GPRS technology.

So through our proposed system we are providing automatic bus transport system which reduces the man power

BOARD HARDWARE RESOURCES FEATURES

GSM

An embedded system is a special-purpose system in which the computer is completely encapsulated by or dedicated to the device or system it controls. Unlike a general-purpose computer, such as a personal computer, an embedded system performs one or a few pre-defined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded systems are often mass-produced, benefiting from economies of scale.
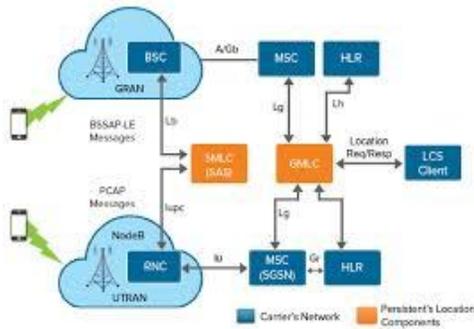

Fig: GSM architecture

Global System for Mobile Communication (GSM) is a set of ETSI standards specifying the infrastructure for a digital cellular service. The standard is used in approx. 85 countries in the world including such locations as Europe, Japan and Australia.

RFID

Many types of RFID exist, but at the highest level, we can divide RFID devices into two classes: **active** and **passive**.

Active tags require a power source i.e., they are either connected to a powered infrastructure or use energy stored in an integrated battery. In the latter case, a tag's lifetime is limited by the stored energy, balanced against the number of read operations the device must undergo. However, batteries make the cost, size, and lifetime of active tags impractical for the retail trade. Passive RFID is of interest because the tags don't require batteries or maintenance. The tags also have an indefinite operational life and are small enough to fit into a practical adhesive label. A passive tag consists of three parts: an antenna, a semiconductor chip attached to the antenna and some form of encapsulation. The tag reader is responsible for powering and communicating with a tag. The tag antenna captures energy and transfers the tag's ID (the tag's chip coordinates this process). The encapsulation maintains the tag's integrity and protects the antenna and chip from environmental conditions or reagents.

GPS:

Global Positioning System tracking is a method of working out exactly where something is. A GPS tracking system, for example, may be placed in a vehicle, on a cell phone, or on special GPS devices, which can either be a fixed or portable unit. GPS works by providing information on exact location. It can also track the movement of a vehicle or person. So, for example, a GPS tracking system can be used by a company to monitor the route and progress of a delivery truck, and by parents to check on the location of their child, or even to monitor high-valued assets in transit.
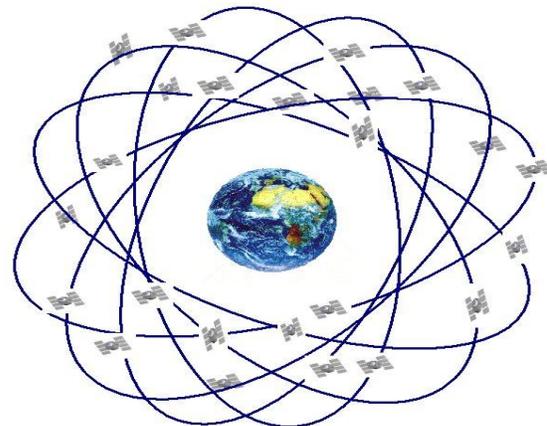

Fig: GPS location tracking

A GPS tracking system can work in various ways. From a commercial perspective, GPS devices are generally used to record the position of vehicles as they make their journeys. Some systems will store the data within the GPS tracking system itself (known as passive tracking) and some send the information to a centralized database or system via a modem within the GPS system unit on a regular basis (known as active tracking) or 2-Way GPS.

L293D

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications. On the L293, external high-speed output clamp diodes should be used for inductive transient suppression.

MOTORS

Motors are configured in many types and sizes, including brush less, servo, and gear motor types. A motor consists of a rotor and a permanent magnetic

field stator. The magnetic field is maintained using either permanent magnets or electromagnetic windings. DC motors are most commonly used in variable speed and torque. Motion and controls cover a wide range of components that in some way are used to generate and/or control motion. Areas within this category include bearings and bushings, clutches and brakes, controls and drives, drive components, encoders and resolves, Integrated motion control, limit switches, linear actuators, linear and rotary motion components, linear position sensing, motors (both AC and DC motors), orientation position sensing, pneumatics and pneumatic components, positioning stages, slides and guides, power transmission (mechanical), seals, slip rings, solenoids, springs. Motors are the devices that provide the actual speed and torque in a drive system. This family includes AC motor types (single and multiphase motors, universal, servo motors, induction, synchronous, and gear motor) and DC motors (brush less, servo motor, and gear motor) as well as linear, stepper and air motors, and motor contactors and starters.

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

CONCLUSION

In this paper, we present a crowd-participated bus arrival time prediction system. Primarily relying on inexpensive and widely available cellular signals, the proposed system provides cost-efficient solutions to the problem. We comprehensively evaluate the system through an Android prototype system. Over a 7-week experiment period, the evaluation results demonstrate that our system can accurately predict the bus arrival time. Being independent of any support from transit agencies and location services, the proposed scheme provides a flexible framework for participatory contribution of the community. For a particular city, the only requirement of our system implementation is that there exist a backend server

and an IC card based bus system. Future work includes how to encourage more participants to bootstrap the system because the number of sharing passengers affects the prediction accuracy in our system. This common issue of crowd-sourced solutions is largely influenced by the penetration rate and popularity of the services. One may actively promote the service to reach a critical penetration rate so as to ensure that at least one sharing user is on the bus willing to report the bus status. At the initial stage, we may encourage some specific passengers (like the bus drivers) to install the mobile phone clients.

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